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ABSTRACT

This paper presents an examination of community college students enrolled in developmental mathematics courses, and their subsequent academic performance in college-level coursework. The study was undertaken to obtain an historical perspective of remedial education in American community colleges and to review the research related to developmental mathematics course-taking in community colleges. The following topics are presented: (1) an introduction to developmental education, including a definition and the reasons for its importance; (2) a review of the literature on this subject; (3) the results of a field investigation, in which the researcher interviewed four developmental education specialists in the Illinois community college system; (4) general developmental mathematics enrollment data for all Illinois community colleges; (5) a description of the developmental mathematics courses at Olney Central College; and (6) conclusions and recommendations. It is concluded that developmental education is an essential function of the community college if these institutions are to fulfill their mission as democratizing colleges, and that much more research is necessary to determine whether developmental education courses are effective in raising students' ability to college-level, enabling students to persist in their courses, and retaining students until they reach their educational objectives. Contains 17 references. (CAK)

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Developmental Course-Taking in Community Colleges

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Abstract

This paper examines community college student enrollments in developmental courses, primarily mathematics, and their subsequent academic performance in college-level coursework. The study was undertaken primarily to obtain an historical perspective of remedial education in American community colleges and to review the research related to developmental mathematics course-taking in community colleges. The research literature of community college remedial educational programs is reviewed, noting the increase in the amount of developmental courses offered in community colleges over the past 10 years. This paper also presents the findings of a field investigation of developmental educational programs at four Illinois community colleges–two small rural institutions, one larger rural institution, and one large urban institution. The findings conclude that little research is available on the effectiveness of community college developmental educational programs as well as research designed specifically to measure the effectiveness of developmental educational mathematics programs and students' subsequent academic performance in college level courses. Implications for conducting further research on developmental educational programs in community colleges are discussed.

Introduction

This paper presents an examination of community college students enrolled in developmental education courses and their subsequent academic performance. Included in this paper are: (a) an introduction to developmental education; (b) a review of the pertinent developmental education literature; (c) field investigation consisting of interviews with four developmental education specialists currently working in Illinois community colleges; (d) a general review of developmental mathematics enrollment data in the Illinois community college system; (e) a review of developmental education mathematics programs at Illinois Eastern Community Colleges; and (f) a summary of the author's examination of developmental educational programs.

Four Illinois community colleges were selected for the field study. Olney Central College in Olney and Lincoln Trail College in Robinson were selected to be representative of a multi-college district. John A. Logan Community College in Carterville was selected because it is one of the larger rural community colleges. Elgin Community College in Elgin was selected to be representative of larger urban community colleges. With the limited amount of time available for the field study, it was felt that these four colleges would provide feedback that would be fairly representative of Illinois community colleges' developmental educational programs.

Cohen and Brawer (1996) define developmental education as activities to keep students in school and to help them improve their basic skills so that they can complete an academic or vocational program satisfactorily. Miller (1996) provides a much broader definition which allows that developmental education is an umbrella term that includes both academic and social/psychological support services for underprepared students. Thus, besides developmental

English, reading, and writing, colleges' developmental educational programs, as defined by Miller, would also include learning skills centers, tutoring, advising, and counseling.

Knowing what developmental education is designed to accomplish in a very limited view and reviewing developmental education in community colleges may not be sufficient for one to develop a meaningful understanding of the many intricate and wide-ranging implications of developmental education. Looking at developmental education philosophically, that is, how it fits into the total education framework in the Unites States, provides a base from which one can then develop a meaningful model for understanding not only the definition of developmental education, but also whom it serves, who benefits from it, and why they need it.

Stanley O. Ikenberry, former president of the University of Illinois and current president of the American Council on Education, takes a very pragmatic view toward developmental education in the United States. While Ikenberry agrees that no one particularly likes remedial education and that it would be easier for faculty and colleges if students came to college already in possession of all they needed to know to pursue whatever program they might want, colleges offer developmental courses simply because students come unprepared (Ikenberry & Stix, 1998).

Ikenberry (Ikenberry and Stix,1998) believes that developmental education is necessary because: (a) many students arrive at college having coasted through high school; (b) not all high schools offer a full complement of college preparatory mathematics and science courses; and (c) many immigrants need help with English or writing. According to Ikenberry (1998), developmental education is an important form of quality control because colleges, through offering developmental educational programs, give students the opportunity to remove deficiencies because they care about quality and enforcement of academic standards. Ikenberry

(1998) also believes that developmental education shores up academic standards while democratizing higher education.

Unfortunately, not everyone supports developmental education. Nicholas Stix (Ikenberry & Stix, 1998) believes that developmental education creates a drain on educational resources that they could better use providing programs for the academically prepared. Stix (1998) also believes that developmental education inflates enrollments and turns colleges into overpriced high schools. While one might argue that the United States needs stronger and better high schools that do a better job of academically preparing students for college, Stix's argument fails to thoroughly address a fundamental issue. That is, if high schools are not properly preparing students academically and if colleges should not be overpriced high schools, then who should address the need for developmental education? Should we ignore the need for developmental education? Ikenberry (1998) states very pragmatically that a need for developmental education exists and that we (community colleges) would be well advised to fix the deficiency.

The entire United States benefits from colleges having effective developmental educational programs. If high schools, for whatever reasons, are not adequately preparing students for college and colleges did not offer developmental educational programs, one might want to ask what would happen to those students. Notwithstanding those students, one might also want to ask what might happen to those students who have been out of formal education for several years who wish to return to complete an associate degree, baccalaureate degree, advanced graduate studies, or those students who simply want to take one or more college-level courses to broaden their horizons. It seems only logical that denying anyone access to higher education would likely lead to more sharply defined classes in American society. Perhaps those who do not support colleges, particularly community colleges, offering developmental educational

programs will soon step forward and show how the United States can afford not to have these programs.

Review of the Literature

In a review of the impact of developmental educational programs at 150 colleges and universities throughout the United States, Boylan and Bonham confirmed that developmental educational programs seem to work (Weissman, Silk, and Bulakowski, 1997). While they may seem to work, there is little hard evidence to prove that developmental educational programs are successful. Research on developmental educational programs in general is scarce and even more scarce as related to developmental course-taking in mathematics and subsequent academic performance.

Many, if not most, community colleges operate on restricted budgets that prohibit them from having all the programs that would provide the greatest benefit to students. Before 1992, Mesa Community College (MCC) in Arizona, because of its proximity to the state university located just a few miles from the MCC campus, functioned primarily as a transfer institution (Cornell, Fazio, Florschuetz, Howard, Leyva, Martinez, Mee, O'Brien, and Reinders, 1996). Then, in 1992, the demand at MCC for remedial education began to overshadow its transfer function (Cornell, et al., 1996). In Fall 1992, Cornell, et al. found that 65 percent of MCC's students assessed for placement in English, mathematics, and reading scored below college-level in at least one of the three subjects.

Community colleges are just getting started in the process of evaluating the effectiveness of their developmental educational programs. McGregor and Attinasi (1996) conducted an extensive study of students enrolling in Fall 1988 at Pima Community College (PCC) in Tucson, Arizona. McGregor and Attinasi designed their study to determine: (a) the extent to which

entering students took the placement tests in writing, reading, and mathematics according to college policy; (b) the extent to which students followed recommendations, based on these tests, to take developmental courses; and (c) the relationship between completion of recommended developmental courses early in one's PCC career and subsequent academic performance as indicated by GPA, the rate of completed to attempted courses, and graduation.

The McGregor and Attinasi (1996) study concluded that when comparing either students who took but failed to complete at least one developmental course in writing, reading, or mathematics by the end of the second semester or students who did not take at least one recommended developmental course in writing, reading, or mathematics by the end of the second semester, students who completed at least one recommended developmental course in writing, reading, or mathematics by that time were more likely to have completed fifteen or more total credits and to have graduated by the end of the fourth year. However, while McGregor and Attinasi initially suggested that taking developmental course work would promote performance in subsequent academic course work, mathematics included, it failed to show a measurable relationship between successful completion of developmental course work and subsequent performance in college-level courses. Their report recommended additional research regarding: (a) the relationship between developmental course-taking and subsequent academic performance; and (b) the causes of high withdrawal rates from recommended developmental courses.

In a 1993 study of developmental educational practices in Virginia community colleges, Allan, Bartek, Melton, Runk, and Schaffer (1995) identified several factors that correlated significantly with the reported effectiveness of developmental educational programs. The factors identified were: (a) organization of the delivery system for developmental education;

(b) the level of the administrator responsible for developmental education; (c) the selection of placement tests; (d) the process of assigning faculty to teach developmental education courses; (e) the provision of special training for faculty to work with developmental students; (f) restrictions placed on the course load of developmental students; (g) established process for reviewing costs related to developmental education; and (h) consideration of ways to reduce program costs (Allan, et al., 1995).

New York City Technical College (1995) identified the characteristics of a successful student as having: (a) a good high school average; (b) high placement test scores; (c) some academic aptitude; (d) knowledge about the importance of developmental skills and about the relationship between successful completion of developmental studies and performance in college-level courses in their major; (e) a commitment to their studies and willing to invest four to five hours per week for each class; (f) readiness to use tutors and the Learning Center; and (g) determination to accomplish their goals.

Mandatory placement of students through ASSET, ACT, SAT, or other forms of standardized entry assessment instruments is an accepted practice at most American community colleges. In Illinois, all community colleges use some type of college placement test (ICCB, 1997). While Brint and Karabel (1989) believe that testing students is a form of labeling and that these tests negatively affect overall student achievement and self-esteem, Amey and Long (1998) recognize the need for assessment and subsequent placement to justify resource expenditures on programs that meet the needs of underprepared students.

A study of mandatory placement testing and subsequent placement in developmental educational programs at Johnson County Community College in Overland Park, Kansas, showed that there was a high correlation between mandatory placement in reading and English and

overall student academic success (Amey & Long, 1998). Amey and Long (1998) also found that there was a significant relationship between overall achievement and successful early completion of developmental reading and English courses, though enrollment in the reading course during the first semester was the only institutional requirement.

With little hard data from research on the effectiveness of developmental educational programs, community colleges are often hard-pressed to show whether or not their developmental educational programs are effective. Doucette and Hughes (Pierson, 1997) provide a series of questions designed to guide a college in assessing the performance of its basic skills and developmental education mission. Their questions include: (a) are students attaining the skills identified in course and program objectives; (b) are students completing courses and progressing through at reasonable rates; (c) are students progressing to and succeeding at the next level of education; (d) are students from different subgroups succeeding at comparable rates; and (e) are students' success rates comparable among various college programs for underprepared students.

Effectiveness lends itself to describing outcomes for students whereas efficiency lends itself to describing how well an institution meets its mission objectives. All programs, developmental as well as college transfer, technical, community service, and workforce education, compete for their piece of the community college budget. According to Boylan (1983), it would be wise for community college administrators to be mindful that, as far as educational efficiency is concerned–not to mention cost-effectiveness–to try to retain potentially successful students rather than constantly have to replace currently enrolled students through new admissions. Therefore, community colleges with effective developmental educational programs ought to have higher than average student retention.

In a 1996 study of developmental education outcomes at Minnesota community colleges, it was determined that developmental course completers' persistence rates were: (a) higher than students who failed to enroll in prescribed developmental education courses; and (b) either significantly higher than or not significantly different from those of college-prepared students (Shoenecker, Bollman, and Evens, 1996). The findings of Shoenecker, et al. (1996), while indicating that successful development education completers did as well as or better than the college-prepared students, also suggested that developmental education improved the success of underprepared students such that their performance was indistinguishable from that of college-prepared students.

Developmental Mathematics in Illinois Community Colleges

Community colleges in Illinois have seen a tremendous growth recently in the need for developmental education. In Illinois, community colleges have been designated as the state's primary providers of developmental education (Illinois State Board of Higher Education [IBHE], 1997). In fact, nine out of ten Illinois students who took a remedial/developmental course in 1996 did so at a community college (IBHE). In addition, developmental mathematics was clearly the area where Illinois community college students most frequently enrolled for remediation in fiscal year 1991 and fiscal year 1996 (ICCB, 1997). The ICCB reported that results of a 1996 study at Moraine Valley Community College indicated that students who completed their recommended remediation courses and whose skills were then in the mid- to upper-developmental range performed well in subsequent college-level courses. During fiscal year 1991 to fiscal year 1996, the need for developmental education increased by 45 percent (ICCB, 1997). The ICCB attributed much of the increase due to the reclassification of

intermediate algebra and geometry from college-level to developmental because of new college admission requirements started in Fall 1993.

This increase in the need for developmental mathematics by Illinois community college students is even more pronounced when you consider that statewide, all developmental credit hours generated increased by 45 percent while requirements for developmental communications decreased by 9.6 percent. Therefore, the vast majority of the increased need for developmental education in Illinois community colleges from fiscal year 1991 to fiscal year 1996 was in developmental mathematics (ICCB, 1997).

When discussing the composition of students enrolled in developmental education courses, someone will invariably cast stones at the secondary system for not properly preparing their graduates for college-level work. The ICCB (1997) study seems to show this is not necessarily the case in Illinois. In fact, of all the Illinois community colleges students enrolled in developmental education courses in fiscal year 1996, only 33 percent were recent high school graduates (ICCB). Still, one might ask why 33 percent of Illinois high school graduates are not prepared for college-level work. The ICCB study goes on to say that more than one-half of the students enrolled in developmental education courses are over the age of twenty-two. Although the enrollment of ethnic students in developmental education courses in Illinois community colleges decreased in all categories from fiscal year 1991 to fiscal year 1996, the ICCB study showed that minority students were more likely to enroll in developmental education courses than white students. The ICCB study also noted that 57 percent of the students enrolled in developmental courses were female. This data coincides with the fact that 56 percent of all students enrolled in Illinois community colleges in fiscal year 1996 were female (ICCB).

Because of recently implemented ICCB reporting requirements, Illinois community colleges have already implemented or are in the process of starting programs to track students enrolled in developmental education courses. The success of developmental education course completers in their subsequent college-level courses is one measure of institutional effectiveness that Illinois community colleges, as well as all other American community colleges, may want to showcase in their institution's assessment plan.

Field Investigation

My field investigations consisted of interviews with developmental education specialists at four Illinois community colleges. I conducted personal interviews with: (a) Donita Kaare, Director of the Learning Skills Center at Olney Central College (OCC) in Olney; (b) Searoba Mascher, Director of the Study Skills Center at Lincoln Trail College (LTC) in Robinson; (c) Jim Harris, full-time developmental mathematics instructor at John A. Logan College (JALC) in Carterville; and (d) Annabelle Rhoades, Director of the Learning Skills Centers at Elgin Community College (ECC) in Elgin. Each developmental educator was asked to respond to the same set of six questions. Their responses are categorized by each question:

Which type of developmental mathematics instruction is more effective–programmed instruction (flexible options) or traditional classroom instruction?

S. Mascher, J. Harris, & A. Rhoades (personal communications, July 1998) believe that traditional classroom instruction for beginning and intermediate algebra is more effective than programmed instruction. They base their opinion on their experience that students, especially those having recently graduated from high school, typically lack the self-discipline necessary to spend the required time in a learning laboratory. D. Kaare, (personal communication, July 1998) believes that programmed instruction is more effective because, unlike traditionally taught

developmental courses, programmed instruction is competency-based. That is, OCC requires that students achieve 80 percent correct on a given module before they are allowed to move sequentially to the next module. OCC is the only one of the four community colleges at which developmental education faculty and staff were interviewed that offers both types of developmental mathematics instruction. In addition, students in both the traditional and programmed instruction programs at OCC use the same developmental mathematics textbook and take the same tests.

The two points on which D. Kaare, S. Mascher, J. Harris, & A. Rhoades (personal communications, July 1998) all agree are that: (a) older students may be more disciplined and do much better in developmental mathematics courses; and (b) despite the type of developmental instruction students receive, the instruction needs to be enhanced with some type of human interaction to reinforce students' successes.

What are some things you might want to examine in trying to predict developmental mathematics students' success in their first college-level mathematics course?

D. Kaare, S. Mascher, J. Harris, and A. Rhoades (personal communications, July 1998) agree that the number one predictor of students' success is their attendance. Imagine that! They believe that in order for students to learn mathematics, especially developmental mathematics, they must be active participants in the teaching and learning process. Similarly, D. Kaare, S. Mascher, J. Harris, and A. Rhoades (July 1998) are all in agreement that students' organizational skills and self-esteem also are valid predictors of student success. Thus, besides teaching only developmental mathematics, they must also teach students to become organized in their work habits, to learn to feel good about themselves, and to focus on the positive side of being enrolled in developmental education courses.

What are the variables that can affect students' performance in developmental instruction?

D. Kaare, S. Mascher, J. Harris, and A. Rhoades (personal communications, July 1998) unanimously agree that attendance affects students' performance. They feel that if students do not attend and actively participate in class, they hinder their chances of success. They also believe that students' attitudes also affect their performance. A. Rhoades (July 1998) believes that many students suffer from math anxiety and that it has a negative effect on their performance. D. Kaare, S. Mascher, J. Harris, and A. Rhoades (July 1998) also agree that students' employment (shift work), marital status (single parents), age, and intelligence also affect their classroom performance. J. Harris (July 1998) also feels that students who have recently graduated from high school typically have less maturity than returning adult students. Consequently, younger students may have more problems getting the self-discipline necessary to be successful in their courses.

What professional degree or special training would you recommend for faculty assigned to perform full-time developmental mathematics instruction?

J. Harris (personal communication, July 1998) believes that a Master's degree, preferably in mathematics, ought to be required. However, D. Kaare, S. Mascher, J. Harris, and A. Rhoades (personal communication, July 1998) all agree that experience in teaching developmental mathematics–arithmetic, beginning algebra, and intermediate algebra–is more important than the level and type of degree possessed by the instructor. A. Rhoades (July 1998) also feels that having an understanding of the various backgrounds of typical students enrolled in developmental courses is important for developmental education instructors and how they learn. S. Mascher (July 1998) believes that the developmental education instructors should be student-centered and believe that students can learn.

What are the pitfalls associated with assigning adjunct (part-time) faculty to conduct developmental mathematics instruction?

D. Kaare, S. Mascher, J. Harris, and A. Rhoades (personal communications, July 1998) all agree that it is preferable to have full-time faculty rather than adjunct developmental mathematics instructors because of the commitment they can make. D. Kaare (July 1998) feels there is a serious lack of continuity with adjunct instructors. That is, because adjunct instructors typically do not have an office or maintain scheduled office hours, their students must rely on someone else outside the classroom to answer their immediate concerns. A. Rhoades (July 1998) feels that adjunct instructors teaching developmental mathematics courses have a more difficult time in breaking down the language of mathematics to a level that students can understand and comprehend.

Have you witnessed any increase in students requiring developmental mathematics instruction in the past ten years?

D. Kaare, S. Mascher, and A. Rhoades (personal communications, July 1998) believe there has been a significant increase in the number of students requiring developmental mathematics in the last ten years. They attribute much of the increase to mandatory mathematics placement testing that most community colleges have recently begun. Previously, for various reasons, their colleges allowed many students to bypass developmental mathematics. It might be revealing to analyze students' success in their first college-level mathematics course over the past ten-year period. J. Harris (personal communications, July 1998), while not sure if students' need for developmental mathematics has increased in the past ten years, feels confident that it has certainly not decreased. J. Harris (July 1998) also believes that community colleges are now doing a much better job of placing students in the proper mathematics course.

Developmental Mathematics at Olney Central College

Students pursuing an associate degree or certificate program at Olney Central College, one of the four Illinois Eastern Community Colleges, are enrolled in developmental mathematics based on their score on the ACT Math Placement Test (MPT). Students scoring nineteen to twenty-one on Level One of the MPT or who score twelve or below on Level Two of the MPT are allowed to select one of two options for Beginning Algebra.

The first option is to enroll in a Beginning Algebra course taught by an instructor in a classroom environment with four lecture periods per week for fifty minutes each period. Approximately 50 percent of all students enrolling in Beginning Algebra at Olney Central College each semester select this option. The second option allows students to enroll in a flexible Beginning Algebra format in which the students work at their own pace in a study skills center staffed by an instructor and tutors. The flexible option consists of students receiving individual instruction, computer-based review, Beginning Algebra videos, and tutorial support. Students in this option must select 4 four-hour time periods and 3 two-hour time periods they will attend. Students may attend as many hours as they want per week provided they meet the minimum credit hour attendance requirement of the four-semester hour Beginning Algebra course (four hours per week).

Although students at Olney Central College have had the flexible option in developmental mathematics for six years, the program has not been evaluated. D. Kaare (personal communication, July 1998) feels strongly that because OCC requires students enrolled in the flexible option to pass module tests with 80 percent correct before they can move onto the next level, the students are more successful, achieve higher grades, and withdraw from Beginning Algebra less frequently than students enrolled in traditional classroom lecture-type

Beginning Algebra courses. Developmental mathematics faculty and staff at Olney Central College plan to complete their analysis of the grades achieved and successful completion rates of students enrolled in both types of Beginning Algebra courses at OCC by the end of 1999.

Summary, Conclusions, and Recommendations

There is indeed little research on the effectiveness of community college students enrolled in developmental educational mathematics programs and their performance in subsequent college-level courses. What is the case in one state might not necessarily be applicable to another state's community college system. More than anything else, the existing body of developmental education research shows that much more research is needed on all developmental educational programs and services. Thus, community colleges are seemingly presented with a most difficult paradox. With only so many dollars with which to operate, what should receive priority funding–college-level courses or developmental courses? If community colleges are to truly democratize education in the United States, that is, make higher education available to everyone regardless of their past academic shortcomings, then, according to Ikenberry (Ikenberry and Stix, 1998), the answer to this question is apparent. Community colleges must provide developmental educational programs because if students, whatever their age might be, are not academically at college-level when they arrive at the community college, then the community college must give students the opportunity to develop to the point they can be successful in college-level courses.

According to Brint and Karabel (1989), one of the most distinctive features of the American educational system–and one that is fundamental to its openness–is that it gives students with undistinguished academic records multiple chances to succeed. In my opinion, developmental educational programs are essentially the only way that students with

undistinguished academic records, as referenced by Brint and Karabel, can have multiple chances to succeed in higher education. Again, if community colleges are truly to democratize education in the United States, then they must incorporate effective developmental educational programs into their mission and give them funding priority.

More importantly, if community colleges are to truly become learning colleges as defined by O'Banion (1997), and continue receiving the operational funding they desperately need from the state legislatures, it behooves them to find ways to do the research that might show how effective developmental educational programs are in: (a) raising students' academic ability up to college-level; (b) enabling students to persist through completion of their courses; and (c) retaining students until they reach their educational objectives.

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